(12) UK Patent Application (19) GB (11) 2 208 923 (13) A

(43) Date of A publication 19.04.1989

(21) Application No 8819408.9

(22) Date of filing 16.08.1988

(30) Priority data
(31) 8719865 (32) 22.08.1987 (33) GB

(51) INT CL⁴
F24C 7/00

(52) UK CL (Edition J)
F4W W45D
F4V VGAC VG241 VG245 V162 V302

(56) Documents cited
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WO 82/00560 A1

(58) Field of search
UK CL (Edition J) F4W, H5H HAA5 HAA9
INT CL⁴ F24C

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(54) Space heater/cooler unit

(57) A space heater/cooler unit 1 comprises a metallic casing 2, a reflector 19 secured to a portion of the casing 2, at least one linear quartz radiant heating element supported in close proximity to the reflector 19, an air intake aperture provided in the casing 2, and a fan 11 adapted, in use, to draw air into the casing 2 through the inlet aperture and to expel air from the casing 2 in proximity to the heating element(s) for cooling purposes, with user-operable switching means to control, in a heating mode, simultaneous operation of both the fan 11 and heating element(s) or, in a cooling mode, operation of the fan 11 only. A building may incorporate the unit inside the building above an external access doorway. The fan may have two speeds.

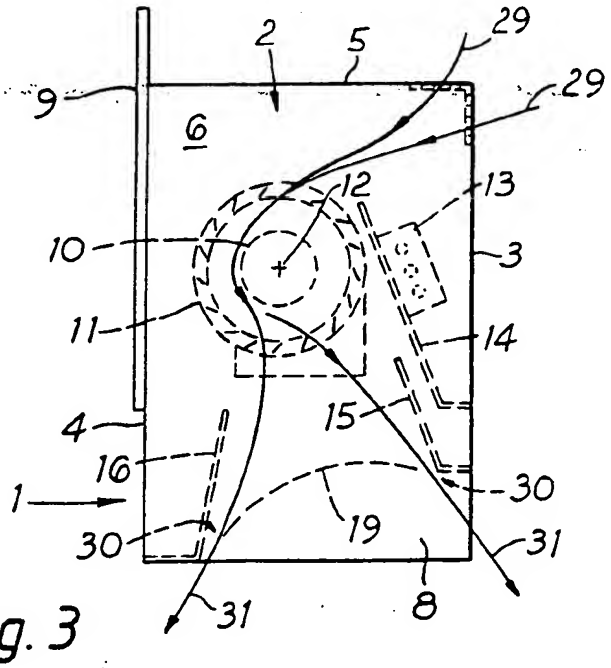

Fig. 3

This print takes account of replacement documents submitted after the date of filing to enable the application to comply with the formal requirements of the Patents Rules 1982.

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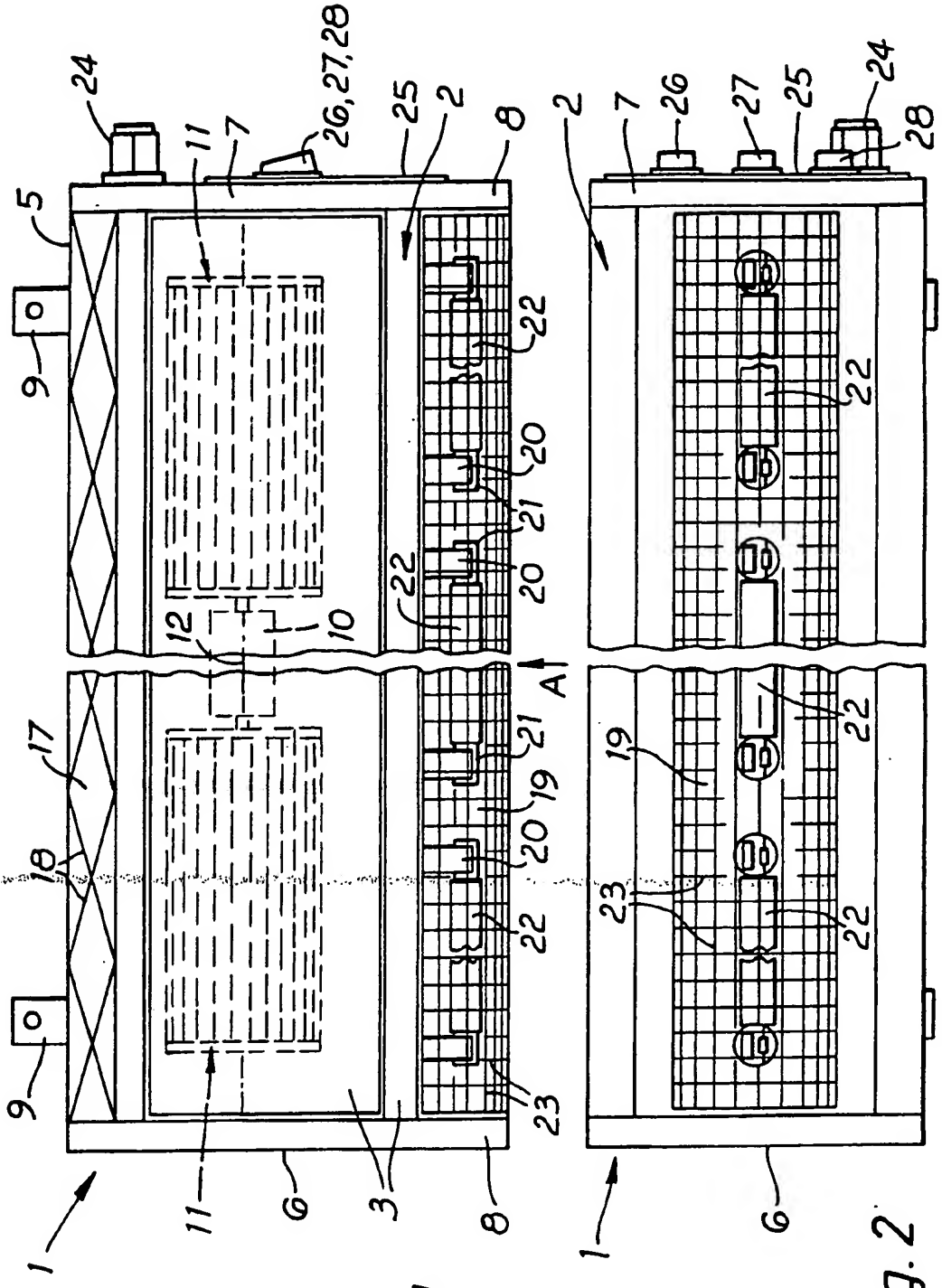
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Fig.1

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Fig.2

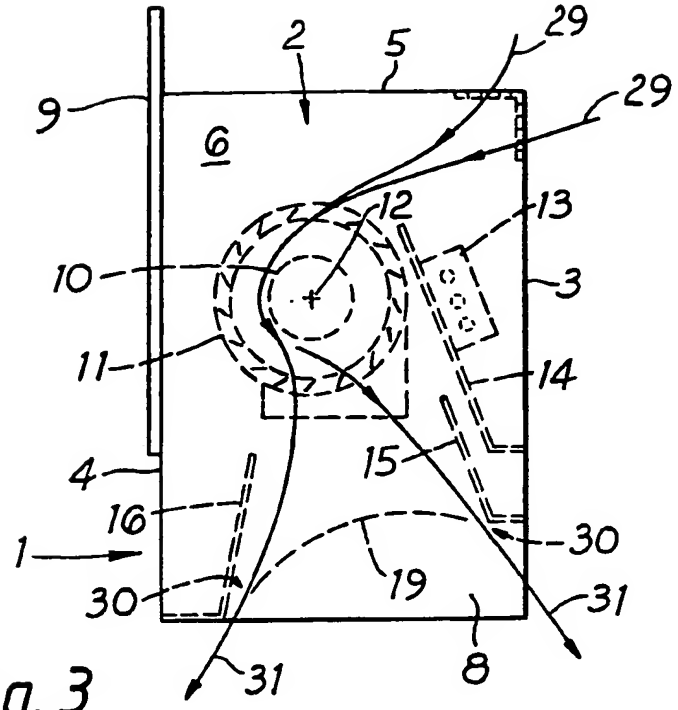
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Fig. 3

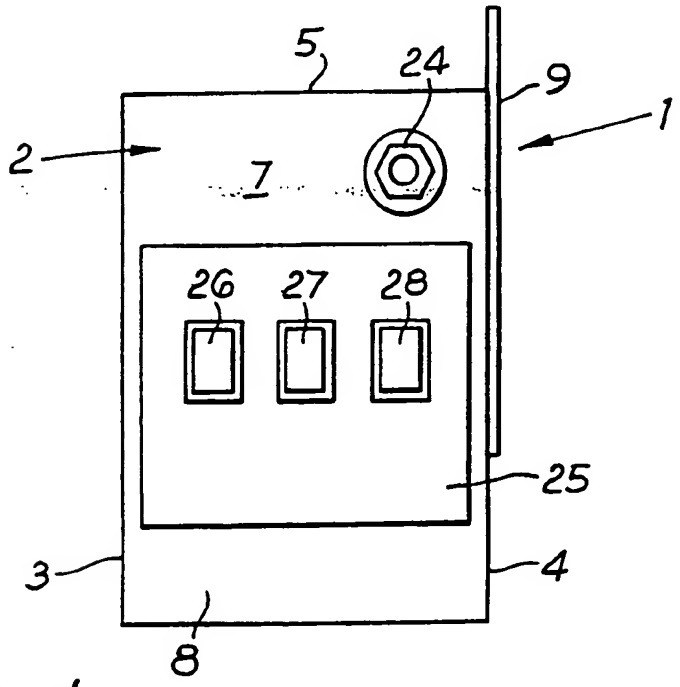
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Fig. 4

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SPACE HEATER/COOLER UNIT AND BUILDING CONSTRUCTION INCORPORATING SAME

This invention relates to a space heater/cooler unit and to a building construction incorporating at least one heater/cooler unit, particularly for a building with frequent access by public or customers, such as a high street shop, a shopping arcade, a theatre, a public house, a restaurant, a department store etc.

A now common practice evolved over recent years is the provision of an electric heating device at the inside of a building above a doorway - either an outside doorway, or possibly over an inner doorway of a pair of spaced apart inner and outer doorways. The heating device has been of a fan heater type, with the fan aiming to provide a downwardly moving curtain of warm air, the fan pushing, or sucking, air from within the building over the heating element(s) of the heating device, with the warmed air then urged downwardly to floor level. Such physical movement of considerably volumes of air is not energy efficient, for clearly air movement alone effects no temperature increase, whilst considerable energy is expended by the fan in attempting to throw warmed air to floor level from the installed height of the heating device - say 8 ft. The use of a fan type heating device is in itself relatively noisy, frequently resulting in wasted floor area, as persons cannot be, or decline to be, located in close proximity. Furthermore, although designed for long life, the fan blade bearings will inevitably wear causing further noise and/or failure, requiring maintenance and/or replacement, while the minimum power of this type of heating device is

usually 9kW.

The object of the present invention is to provide a space heater/cooler unit and a building construction incorporating such a space heater/cooler unit in which the running costs of a doorway installed heating device can be considerably reduced.

According to a first aspect of the invention, there is provided a space heater/cooler unit, comprising a metallic casing, a reflector secured to a portion of the casing, at least one linear quartz radiant heating element supported in close proximity to the reflector, an air intake aperture provided in the casing, and a fan adapted, in use, to draw air into the casing through the inlet aperture and to expel air from the casing in proximity to the heating element(s) for cooling purposes, with user-operable switching means to control, in a heating mode, simultaneous operation of both the fan and heating element(s), or, in a cooling mode, operation of the fan only.

According to a second aspect of the present invention, there is provided a building construction with a public or customer access doorway, having located above the doorway, at the inside of the building, a space heater/cooler unit as defined above.

According to a third aspect of the present invention, there is provided a building construction with a public or customer access doorway, having located above the doorway, at the inside of the building, an electrically operated, radiant heating device comprising a reflector and at least one associated linear quartz heating element so as to radiate

infra-red radiation substantially vertically downwardly towards floor level.

The present invention, in departing from conventional thinking by abandoning the use of a fan to throw heated air to floor level by moving to a radiant heating element(s) enables considerable cost savings to be realised, e.g., a 3kW heater/cooler unit in accordance with the invention provides the equivalent heat output of a conventional 12 kW fan heater.

Thus, in winter conditions and hence with the unit in its heating mode, the fan serves merely to cool the element(s) and hence has a relatively light duty. As a result it has a minimal noise output and long life. On the other hand, in summer conditions if a cooling effect is required the fan is operated without the element(s) and consequently, when installed above a doorway for instance, blows air downwardly. The different requirements of winter and summer can readily be achieved in accordance with a preferred proposal of this aspect of the invention, whereby the fan is provided with a two-speed electric motor, with the lower speed being employed in the heating mode and the higher speed employed in the cooling mode, and in the latter mode an enhanced cooling effect can be achieved by discharging the air through a restricted orifice or plurality of such orifices.

In detail, each heating element may be of 1 or 1.5 kW capacity. Thus, for a doorway having double doors a 3 kW heater/cooler unit would be provided, whilst for a single doorway a 2 kW unit would suffice. With a 3 kW unit, the switching means is such that one, two or all three elements are selectively operable. With a unit having 2 or 3

elements, the latter are located end to end, so that the casing is elongate, and for a unit adapted to be mounted over a doorway, the switches may be provided on one endwall of the casing. Thus, for a 3-element unit, three switches would be provided on the end wall, a first for controlling on/off switching of one element; a second for controlling on/off switching of two elements; and a third for controlling the speed of fan motor, being one speed operating for winter conditions and higher speed operation for summer conditions. On the other hand, if the unit were to be inset into a false ceiling for instance, then the control switches would need to be remotely located e.g., at a convenient height on an adjacent wall.

Cooling air may be made available over the full length of an elongate casing by locating an electric motor for the fan centrally, with output shafts at each end of the motor to drive two fans located at opposite ends of the motor.

Preferably, the casing is of sheet metal e.g., mild steel, with a painted finish, while the reflector is preferably of extruded aluminium, thus reducing the capital costs of the heating devices compared for instance with those incorporating stainless steel reflectors. Further, the aluminium reflector could be of such dimensions and/or profile as to serve additionally as a structural element, thereby reducing the structural strength required of the casing.

The reflector is conventionally pivotally mounted to provide adjustment so as to focus the heat area precisely where required. Such pivotal mounting may be at opposite ends of a unit length reflector, by pivot pins carried in

support arms extending from the casing. The interior of the latter may also serve as a terminal box, and its exterior may serve for attaching the unit to a wall or ceiling (e.g., by fixing brackets extending from the casing) of the building adjacent and above the doorway with which the heating device is to be associated.

Whilst multiple heating elements may be associated with a common reflector, it is also possible to associate multiple reflectors with a common support structure, and in detail with this latter arrangement, the reflectors may be arranged end-to-end or alternatively may be arranged in a parallel disposition.

As linear quartz heating elements operate at very high temperatures, a protective mesh grill e.g., of stainless steel wire, or chrome plated mild steel, is preferably provided.

The air inlet aperture may extend the longitudinal length of the casing of the unit, and may take the form of a slot with a cover of expanded metal. The slot may extend along one corner of the casing with the cover angled e.g., at 45°, so that the inlet aperture is effective irrespective of whether the unit is wall mounted or inset into a suspended ceiling. Alternatively, the inlet aperture may be formed partly along the front wall and partly along the top wall of the casing, so that the cover is of "L"-section.

The invention will now be described in greater detail, by way of example, with reference to the accompanying drawings, in which:-

Figure 1 is a side elevation of a space heater/cooler unit in accordance with the first aspect of the invention;

Figure 2 is an underneath view in the direction of arrow A of Figure 1;

Figure 3 is an elevation on one end of Figure 1; and

Figure 4 is an elevation on the other end of Figure 1.

In the drawings, a space heater/cooler unit 1 comprises an elongate casing 2 of sheet metal such as mild steel, with a painted finish. The casing is of rectangular, hollow section comprising a front wall 3, a back wall 4, a top wall 5, an end wall 6 and an end wall 7, with each end wall having a downwardly projecting portion 8. To the back wall 4 of the casing 2 are welded a pair of spaced-apart fixing brackets 9, while the hollow interior of the casing houses a two-speed electric motor 10 suitably supported from the casing and opposite sides of the motor 10 are drivably connected to a tangentially bladed, fan 11, the motor and the two fans all being rotatable about the same axis 12. The hollow interior of the casing 2 also houses a conventional terminal block 13 supported on a bracket 14 attached to the front wall 3, while a pair of diverging air deflectors 15, 16 are attached respectively to the front and back walls 3, 4. At the junction of the front wall 3 and the top walls, the casing 2 is provided with an aperture 17 extending the length of the casing 2 and covered with a strip 18 of expanded metal, angled e.g., at 45° with respect to the front and top walls 3, 5. The otherwise open bottom of the casing 2 is closed by a curved reflector 19 of extruded aluminium which is supported from the casing 2 either in a fixed position with respect to the casing 2, or pivotably with respect to the casing 2, the latter to provide for in situ adjustment of the direction of

reflected radiation. Downwardly from the casing 2 extend pairs of element clips 20 of a conventional form, whereby opposite ends 21 of a linear quartz halogen infra red heating element 22 is a push-fit into a pair of clips 20 making electrical contact with the clips, and three end-to-end located elements 22 are shown associated with a common reflector 19, although of course more or less than three could be provided, as required. The reflector 19, is fitted over its full length with a mesh grill 23 enclosing the elements 22. Whilst the end wall 6 is plain, the end wall 7 is apertured to receive firstly an electrical cable entry gland 24, and secondly a switch panel/nameplate 25, having three user-operable rocker switches 26, 27 and 28. Switch 26 controls on/off switching of two of the elements 22 simultaneously; switch 27 controls on/off switching of one of the element 22; and switch 28 controls selection of lower or higher speed for the motor 10.

For clarity, the incoming electrical cable passing through the gland 24 is not illustrated, nor are leads from the cable to the terminal block, to the switches or from the switches to the elements.

It will be appreciated that, in use, the unit 1, or a series of units 1, are located in a shop etc., over an outside doorway of the shop etc. In winter conditions, one or more of the elements 22 are switched on and the motor 10 is switched to run at its lower speed, with the fans 11 serving to draw air into the hollow interior of the casing 2 through the aperture 17, as indicated by air flow path arrows 29 and to produce an air flow, with the air exiting from longitudinal

slots 30 defined between longitudinal edges of the reflector 19 and the deflectors 15, 16, as shown by arrows 31, to cool the unit 1, and in particular the reflector 19 and the elements 22. Alternatively, in a "summer" mode the element(s) 22 remains switched off and the motor 10 may be switched to run at its higher speed, so as to displace a greater volume of air, with the latter directed downardly from the elevated location of the unit 1 towards floor level, exiting through the slots 30.

CLAIMS

1. A space heater/cooler unit, comprising a metallic casing, a reflector secured to a portion of the casing, at least one linear quartz radiant heating element supported in close proximity to the reflector, an air intake aperture provided in the casing, and a fan adapted, in use, to draw air into the casing through the inlet aperture and to expel air from the casing in proximity to the heating element(s) for cooling purposes, with user-operable switching means to control, in a heating mode, simultaneous operation of both the fan and heating element(s), or, in a cooling mode, operation of the fan only.

2. A unit as claimed in Claim 1, provided with three elements.

3. A unit as claimed in Claim 2, wherein each element is of 1 or 15 kW capacity.

4. A unit as claimed in Claim 2 or Claim 3, wherein the elements are located end-to-end.

5. A unit as claimed in any preceding claim, wherein the fan is provided with a two-speed electric motor.

6. A unit as claimed in Claim 5, wherein the motor is located centrally of the unit and one fan is located at each opposite end.

7. A unit as claimed in any preceding Claim, wherein the reflector is of extruded aluminium.

8. a unit as claimed in any preceding Claim, wherein the reflector is covered with a mesh grill enclosing the element(s).

9. A unit as claimed in any preceding Claim

comprising an elongate, sheet metal casing of rectangular hollow section.

10. A unit as claimed in Claim 9, wherein one end wall of the casing is provided with user-operable control switches.

11. A unit as claimed in Claim 10, when appendent to Claim 2, wherein three switches are provided, a first for controlling on/off switching of one element; a second for controlling on/off switching of two elements; and a third for controlling the speed of the fan motor, being one speed operating for winter conditions and higher speed operation for summer conditions.

12. A unit as claimed in any preceding Claim, wherein the reflector is fixedly mounted with respect to the casing.

13. A unit as claimed in any one of Claims 1 to 11, wherein the reflector is pivotally mounted with respect to the casing.

14. A unit substantially as hereinbefore described with reference to the accompanying drawings.

15. A building construction with a public or customer access doorway, having located above the doorway, at the inside of the building a space heater/cooler unit as defined in Claim 1.

16. A building construction with a public or customer access doorway, having located above the doorway, at the inside of the building, an electrically operated, radiant heating device comprising a reflector and at least one associated linear quartz heating element so as to radiate infra-red radiation substantially vertically downwardly

towards floor level.

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